

IMPLANT FOR OSTEOSYNTHESIS DEVICE AND TOOL FOR SETTING SUCH IMPLANT

TECHNICAL FIELD

5 The present invention relates to an implant for osteosynthesis device, particularly of the backbone, comprising a bone anchoring device topped by a fixing head constituted by two lateral branches forming an open U and intended to receive a linking rod with a view to immobilization thereof by clamping via a threaded nut adapted to screw on corresponding
10 threaded parts produced on the outer walls of the lateral branches of the fixing head.

Different implants of which the fixing body comprises lateral branches forming a channel for receiving a linking rod, have been described.

PRIOR ART TECHNIQUE

15 For example, in French Patent Application No. 2 711 909, the lateral branches of the U forming the head are threaded, not only on the outside, but also on the inside, in order to receive a conical plug intended to space the branches apart in order to immobilize the nut.

In this device, it is necessary to engage the nut by hand on the outer threading of the
20 head, then the plug in the inner threading of the bone anchoring device in place on the patient before effecting definitive blocking thereof via two distinct appropriate tools.

This device, of relatively simple design, is easy to carry out, but it is necessary to use two tools and previously to engage the nut and the plug in their corresponding threading by hand, this being effected with a certain trial and error method and under unfavourable
25 conditions by reason of execution during a surgical operation.

It has been proposed, in European Patent Application No. 0 528 706 or

in French Patent No. 2 658 414, to effect clamping of the rod via an auxiliary bearing element intended to be previously inserted between the branches of the fixing head in order to ensure a better contact with the rod.

5 In that case, the additional difficulty consists in the manipulation of the intermediate bearing element which it is necessary to insert between the parallel branches of the fixing head.

It will be understood that this difficulty of centering the bearing element would be further increased if the bearing element were rendered fast with the nut, since the practitioner had to both feel around for the indexing of the bearing element, hidden by the nut, and screw the nut on the head, blind.

10 It is an object of the invention to overcome the different drawbacks set forth hereinabove by proposing a device allowing a solid fixation and simple and easy positioning of a bearing element for a linking rod.

15 STATEMENT OF THE INVENTION

The invention relates to an implant for osteosynthesis device of the backbone, comprising a bone anchoring device topped by a fixing head constituted by two lateral branches forming an open U and designed to receive a linking rod with a view to immobilization thereof by clamping, via a threaded nut adapted to screw on corresponding
20 threaded parts produced on the partially cylindrical outer walls of the lateral branches of the fixing head, characterized in that the nut comprises, in its diametral zone, a plate mounted in free rotation.

The width of the plate is adapted to allow slide of said plate between the branches of the fixing head, defining two lateral clearances on either side of said plate for the passage of
25 the branches of the U inside the nut and the insertion of the two pins of an auxiliary tool for gripping the nut in order to facilitate mounting thereof on the fixing head.

The fixing head comprises two grooves made opposite on the inner walls of these branches of the U in order to ensure, after mounting of the rod, the

guiding of the pins of the tool on the head and, consequently, a blind indexing of the plate between the branches of the U of said head, before and during clamping of the nut which supports it, clamping being effected via the same tool.

- 5 The present invention also concerns the characteristics which will emerge in the course of the following description which will have to be considered separately or in all of their possible technical combinations.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 This description, given by way of non-limiting example, will show more clearly how the invention may be carried out, with reference to the accompanying drawings, in which:

Figure 1 is an exploded view on a double scale of an implant in accordance with an embodiment of the invention and of an associated tool intended for setting it, views 1A, 1B, 1C respectively representing an anchoring device, a nut, a tool, of which only the end has been shown.

Figure 2 is a view in longitudinal section of **Figure 1**, views 2A, 2B, 2C respectively showing the anchoring device, the nut, the tool.

Figure 3 is a plan view of the anchoring device.

Figure 4 is a plan view of the nut.

- 20 **Figure 5** is a side view of the nut of which half is a section along line V-V of **Figure 4**.

Figure 6 is a view on scale 1 of a setting tool, shown partially in section.

BEST MANNER OF IMPLEMENTING THE INVENTION

- 25 The implant shown in **Figures 1A** and **1B** is constituted by a bone anchoring device 1 comprising a self-tapping pedicular screw known per se, composed of a threaded part 2 with wide screw pitch, intended to be screwed in the bone, and a visible upper part constituting a

fixing head 3 for a rod 4 for linking between two successive bone anchoring devices 1.

The fixing head 3 is constituted by two lateral branches 5 forming an open U intended to receive the linking rod 4.

5 The outer faces 5a of the branches 5 are inscribed in a cylinder and are threaded in order to receive a corresponding threaded nut 6 adapted to be screwed on the head 3 with a view to clamping on the rod 4, once in place.

The rod 4 is cylindrical and it is also knurled over the whole of its outer surface, so as to avoid slidings after clamping and in order to improve immobilization of said rod.

10 The bottom 7 of the U formed by the fixing head 3 presents a radius corresponding substantially to that of the rod 4 and is also knurled.

The clamping nut 6 presents, as known per se, a hexagonal outer cross-section 6a in order to allow it to be gripped by a corresponding tool and comprises a threaded cylindrical inner part or tapping 6b intended to be screwed on the threaded part of the head 3 of the bone anchoring device 1.

15 The nut 6 comprises, in its diametral zone, a plate 8 mounted to rotate freely, of which the width L is such that it allows axial slide thereof between the branches 5 of the U of the fixing head 3, while defining with respect to said nut 6, two lateral clearances 9 intended, on the one hand, for the passage of the branches 5 of the head 3, during screwing of the nut 6, and, on the other hand, for the insertion of two pins 11 of an auxiliary tool 10 for gripping said
20 nut 6, in order to facilitate assembly thereof on the fixing head 3.

The inner walls 5b of the opposite branches 5 of the fixing head 3 comprise two grooves 12 at the centre of said walls.

25 These grooves serve to ensure, after positioning of rod 4, the guiding of the pins 11 of the tool 10 on the head 3 and, consequently, a blind indexing of the plate 8 between the branches 5 of the U of the head 3, before and during clamping of the nut 6 which supports it. The nut 6 is clamped via the same tool 10.

According to another characteristic of the invention, the plate 8 comprises, on its lateral edges 8a, two notches 13 each forming part of a lateral clearance 9. The notches 13 define, in

complement and in cooperation with the guiding grooves 12 of the branches 5 of the fixing head 3, housings 12/13 intended for the introduction and positioning of the pins 11 of the tool 10. As illustrated in the drawings, the width L of the plate 8 taken perpendicularly to the diametral direction of the nut 6, presents a value for example substantially equal, apart from the notches 13, to the spacing between the branches 5 of the fixing head 3.

According to another characteristic of the invention, the surface of the plate 8b is concave and congruent of the surface of the cylindrical rod 4 and knurled for a better adherence on said rod 4.

The plate 8 is fixed to rotate freely on the nut 6 by an adequate crimping 8c (Figure 5).

According to the embodiment shown, the bone anchoring device is a pedicular screw but, of course, it may be question of any other means, such as for example a hook.

It should also be noted that all the elements which have just been described and constituting the implant, are made of a titanium alloy or equivalent material of which the amagnetic properties do not create artefacts during IRM or scanner examinations.

The invention also concerns the particular structure of the auxiliary tool 10. As shown particularly well in Figures 1C, 2C and 6, said tool is constituted by a cylindrical sleeve 16 comprising an end part 17, forming a female hexagonal endpiece 18, adapted to cooperate with the nut 6 of the implant and in which opens out a bore 19 intended for axial slide of a sliding member 20.

The sliding member 20 comprises an emerging end 21 constituted by two partially cylindrical lateral branches 22 forming an open U and of which the outer walls 24 are threaded so as to allow prior screwing of the nut 6 on the tool, while allowing free slide of the plate 8 of said nut between said threaded branches 22 of this same tool 10.

In this way, the nut 6, previously screwed on the branches 22 of the tool 10, may, after its positioning on the fixing head 3 via the pins 11 in the grooves 12 of the branches 5 of said

head, be transferred directly from the threading 24 of the tool 10 to the threading 5a of the head 3. Transfer is effected via the hexagonal endpiece 18 actuated in rotation by the operator, while immobilizing the sliding member likewise by rotation.

The nut 6 will be rotated until it is blocked on the rod 4 via the plate 8.

- 5 For a better grip of the tool 10, the upper zone 26 of the cylindrical sleeve 16 and the upper end 25 of the sliding member 20 are knurled.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100